Rigorous Continuum Limit
for the Discrete Network Formation Problem

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Motivated by recent physics papers describing the formation of biological transport networks we study a discrete model proposed by Hu and Cai consisting of an energy consumption function constrained by a linear system on a graph. We study the existence of solutions to this model, propose an adaptation so that a macroscopic system can be obtained as its formal continuum limit, and show the global existence of weak solutions of the macroscopic gradient flow. For the spatially two-dimensional rectangular setting we prove the rigorous continuum limit of the constrained energy functional as the number of nodes of the underlying graph tends to infinity and the edge lengths shrink to zero uniformly. This is joint work with J. Haskovec and P. Markowich.